My Experiences at a Mu-Spin/NOVA Workshop and NOVA's Overall Importance to Innovative Changes in Teaching Science and Mathematics

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In actuality I was not very thrilled about traveling to and attending a four-day NASA NOVA (NASA Opportunities for Visionary Academics) workshop as requested by my Provost; especially not excited, since, at that time, another demanding academic year was winding down and thereupon ushering in the typical rush of last minute material to be covered in classes and the inevitable close of school issues for the year. The workshop was scheduled to begin on April 16th, and I had received the request to attend only ten days earlier. I reluctantly agreed, along with a colleague from the Department of Education, to represent Spelman College at the workshop. Little did I know what awaited us at Prairie View A&M University, the workshop's host institution, nor did I think the workshop would be significantly beneficial to my professional duties at Spelman--teaching, research and college-community service. Nevertheless, I flew, on the evening of April 16, 2000 to Houston, Texas, to join other participants of the workshop—some fifty or so other faculty members, and the workshop organizers and presenters from NASA sites and various Universities.

Upon boarding a bus the next morning for the trip from Houston to Prairie View A&M University—we stayed in Houston and traveled the approximate one hundred-plus miles round trip daily—I, by happenstance, sat next to my colleague from Spelman, Dr. Judy B. McPherson, a relatively new faculty member at the College. From previously viewing each other as distant colleagues, working in different areas of the College, we immediately began to converse about issues at the College and Atlanta and why we were tagged for this trip, as opposed to two other faculty members, and what we might expect at the workshop. From that morning onward, we sat together to and fro between Houston and Prairie View A&M University. This juxtaposition turned out to be an important arrangement in our correctly assimilating materials of the workshop; especially, it afforded us with a unique opportunity to anticipate the issues of the day on the forward trip and to reflect on them during the return, particularly in their connection to Spelman. Also, we discovered, over the four days, how valuable the workshop was to us in addressing changes in teaching patterns in science and mathematics, especially how the changes might affect pre-service teachers of grades K-12 and the pedagogy of College Professors.

On entering the site of the workshop for the first day, we each received a large-sized notebook; this handout was to become the main guide of instructional materials for the duration of the workshop. Some sections of the notebook were on:

1. An overview of NOVA,
2. Barriers to changes in an academic setting,
3. NASA Strategic Enterprises,
4. Innovative Instructional Strategies,
5. Inquiry-Based Learning/Conceptual Reconstruction,
6. Action Research,
7. Strategies that Facilitate Learning,
8. New Curriculum Goals and Connections to Standards,
9. Interdisciplinary Approaches in Teaching, and
10. Writing Proposals' Techniques for MU-Spin/NOVA.

My colleague and I discussed—primarily in transit between sites--these materials as they occurred over the duration of the workshop. Through these sessions and after the workshop presentations, we developed the fundamentals of a grant proposal on a possible course for modification in the curricula at Spelman. By workshop's end, only the particulars and a unifying theme for the proposal remained to be developed; these last aspects unfolded shortly upon our return to Atlanta from Houston.

In structuring the primary objectives of our grant application, we decided to infuse the concepts of: interactions between parts[1,2] as critical aspects of learning science correctly, conceptual reconstruction[3–5] to eliminate erroneous knowledge, as is often unintentionally or mistakenly provided to students, and thirdly, action research.[6–8] These three features provided the cohesion needed to solidify the grant application. Using these concepts we developed and submitted a planning grant application to Mu-Spin/NOVA to modify the course, Natural Science 101 (Interdisciplinary Science for non-science majors—a course in a developmental state, at Spelman, with good features already in place). We chose to revamp or enhance this course through the grant application with the objectives of:

1. Implementing the concept of interaction between parts, components, and systems as an essential feature in students' learning the conventions and methods of science,
2. Implementing conceptual reconstruction/inquiry-based learning by using the techniques of action research and learning cycles,
3. Completing the development of two-final course modules with one in materials science and the other in light and optics,
4. Providing for the inclusion of aspiring teachers or pre-service teachers in the course,
5. Providing for the systemic inclusion of reading comprehension and scientific writing, and
6. Embracing the missions of NASA in the full operations of this course as a partner with Spelman to address science literacy.

In achieving these objectives, successful outcomes for the course would be:

1. The total course's revision having interaction considerations between parts, components, or systems as a principal theme,
2. The total implementation of conceptual reconstruction and inquiry-based learning as the most important elements of effective teaching of this course,
3. The completion of a present module on light and optics, and the creation of a second on materials,
4. The infusion of reading comprehension, scientific writing, computer simulations and demonstrations in the final two modules of the course,
5. The development of non-science majors and pre-service educators with effective methods and techniques and meaningful knowledge of science, and
6. The inclusion of NASA's missions[9] and its technologies within the course.

These outcomes will be of significant enhancements to the instructional programs and the science objectives at Spellman.[10–12]

Once considered, it is readily apparent that interaction between parts or components is ubiquitous in the sciences, and therefore, science taught correctly must focus on this aspect. This single idea is the overwhelming motivation for its inclusion in our grant application. On the issue of conceptual reconstruction, it occurs to us that students bring to the learning arena terribly erroneous information, such as their thinking that lava during volcano eruption and some earthquakes comes from the liquid-core region of the earth—because at some point they were told that the earth's outer core was liquid, so that's where the liquid magma is coming from, with no thoughts about the involvement of the liquefiable asthenosphere and the actual distance between the earth's surface and its core; or their thinking that the seasons of the year on earth occur because of the distance from the earth to the sun, with no thoughts about the tilt of the earth's axis relative to the sun rays as the true cause. Therefore, systematic efforts must be critically sought-after to eliminate wrong information before true learning can occur. That is where our use of conceptual reconstruction with the inclusion of inquiry-based learning is to be used. Various techniques will be considered during our planning grant on how to implement conceptual reconstruction. And finally, the concept of action research, which is outside the normal professional training of most science faculty—it typically occurs in educational pedagogy, is an important concept in our grant application. It is meant to be the vehicle of immediate feedback and assessment in the classroom setting for "on-the-spot-delivery" of information—there's no meaningful purpose in continuing to teach a concept in the same manner if students are not grasping the basic ideas from that approach. Action research gives the instructor the impetus to adjust his/her delivery techniques. We will observe to what extent formal Action Research intervention "fits" with science teaching at Spelman. I suspect it to receive significant applicability. Therefore, during our present planning grant, these three concepts will be explored to determine their effectiveness.

Currently, we are beginning to consider how to initiate our grant objectives and how to assess the outcomes. I am poignantly mindful of the fact that none of these concepts, quite probably, in connection with NASA's mission and its technologies would be under discussion or consideration without our initial workshop participation at Prairie View A&M University and with the concomitant bus rides between the workshop site and the overnight-stay hotel. What began, for me, as a misconceived idea of another ho-hum trip has developed into a valuable planning grant, a greater understanding of the missions and objectives of: NASA, MURED (Minority University Research and Education Division), MU-Spin, and NOVA and the acquisition of new ideas on how to teach science and mathematics to deserving students.

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